March 2, 1926. 1,574,859

K. BAUMANN

STEAM TURBINE

Filed Jan. 5, 1922

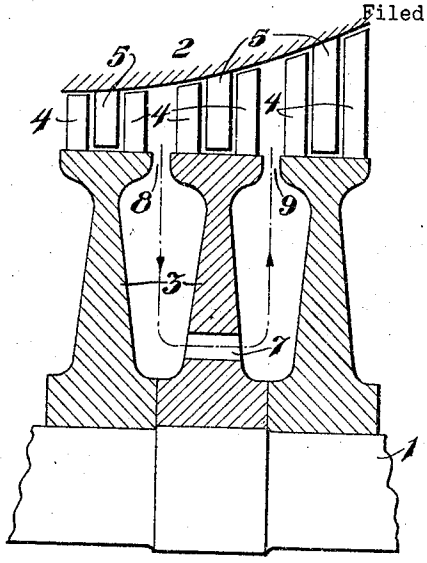


Fig. 1.

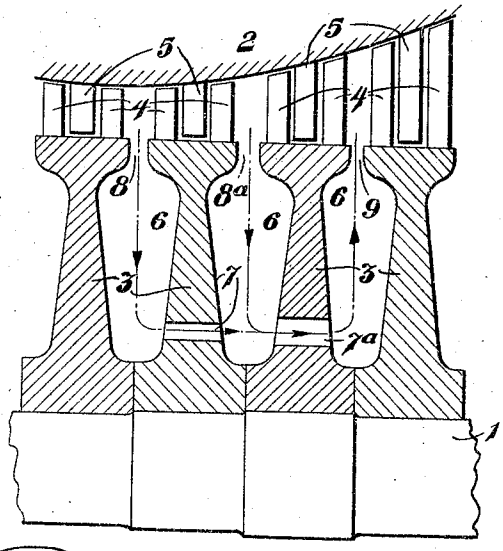


Fig. 2.

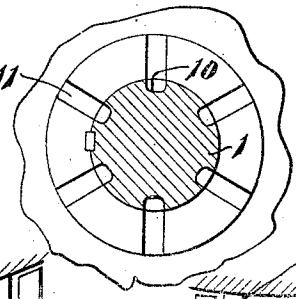


Fig. 4.

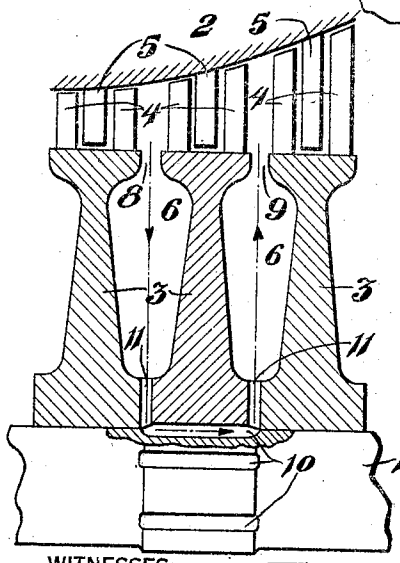


Fig. 3.

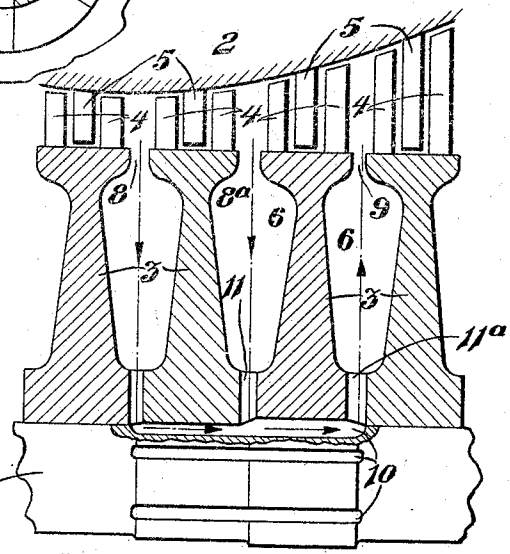


Fig. 5.

WITNESSES:

R. E. B. Wakefield

A. B. Reavis

Karl Baumann
INVENTOR

BY D. C. Davis
ATTORNEY

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UNITED STATES PATENT OFFICE.

KARL BAUMANN, OF URMSTON, ENGLAND, ASSIGNOR TO WESTINGHOUSE ELECTRIC AND MANUFACTURING COMPANY, A CORPORATION OF PENNSYLVANIA.

STEAM TURBINE.

Application filed January 5, 1922. Serial No. 527,123.

To all whom it may concern:

Be it known that I, KARL BAUMANN, a citizen of the Confederation of Switzerland, and a resident of Northwoodhouse, Barnfield, Urmston, in the county of Lancaster, England, have invented a new and useful Improvement in Steam Turbines, of which the following is a specification.

This invention relates to turbines of the reaction type in which discs mounted on the shaft are employed to support the moving blades. In turbines of this type the spaces between the discs become filled with stagnant steam, and when the turbine is started up or when changes of load occur or the turbine is suddenly changed from vacuum to atmosphere considerable differences in temperature occur in various portions of the discs, the periphery for example being much more quickly heated up than the relatively more massive portions near the hub. Such differences in temperature cause stresses to be be set up in the discs, which may give rise to warping or vibration of the discs, which is very undesirable.

The present invention has for its object to provide improved means whereby the temperature of the various portions of the discs in a reaction turbine may be maintained substantially uniform during operation. This is accomplished according to the present invention by providing a passage or passages in the discs or some of them or in the shaft on which the discs are mounted, so as to cause steam to flow to or from the blading on the periphery of the discs through the spaces between adjacent discs.

To enable the invention to be clearly understood it will now be described with reference to the accompanying drawings in which Fig. 1 is a longitudinal section through part of a reaction type turbine showing the blades and discs and one method of ventilating the discs with steam in accordance with the invention. Fig. 2 is a similar view illustrating a modification. Figure 3 is a similar view illustrating a further method, and Fig. 4 is a section on the line IV—IV of Fig. 3. Figure 5 is a view similar to Fig. 3 showing a modification.

Referring to the drawings, 1 represents the shaft of the turbine carrying the moving blades 4 co-operating with the fixed blades 5, supported by the casing 2, and 6 are the spaces between the discs 3.

In the arrangment illustrated in Fig. 1 a circulation of steam through the spaces 6 is obtained in accordance with the invention by means of one or more perforations or holes 7 formed in alternate discs adjacent the hub thereof. In this manner a flow of steam will take place as indicated by the arrows from the blading through the space 8 between the peripheries of the discs through the space 6 inwards towards the shaft thence through the passage 7 and outwards through the next space 6 and thence to the blading through the space 9 between the next adjacent pair of discs, that is to say, into a region of relatively lower pressure. In this manner fresh steam is continually brought into contact with both sides of all the discs.

Although only three discs are illustrated in Fig. 1 it will be understood that the invention is applicable where a greater number is employed and that the perforations 7 will be formed in alternate discs so that a flow of steam takes place from the blading radially inwards on one side and outwards on the other side of each disc.

Referring now to Fig. 2, instead of the passages being made in alternate discs the said passages may be made in consecutive discs but of increasing sectional area progressing from high pressure towards lower pressure regions. Thus the passage or hole 7*a* will be larger than the passage or hole 7 since the latter receives steam from a comparatively high pressure region through the space 8 between the first pair of discs 3, the steam flowing through the passage 7 into the second space 6 between the second and third discs. Steam will also enter the second space 6 through the space 8*a* between the said second and third discs such steam flowing through space 6 and thence, along the steam which has passed through the passage or hole 7, will flow through the passage or hole 7*a* and outwards through the last space 6 into the blading through the space 9 between the last pair of discs. It will be apparent that the steam flow will be inwards or both sides on some of the discs and inwards on one side and outwards on the other side of the remaining discs.

Referring now to the modifications illustrated in Figures 3 to 5 instead of the ventilating passage being formed by a perforation in the disc, passages or grooves 10 may be formed in the surface of the shaft each

of which communicates at its ends with the space 6 between the discs through passages 11 constituted by radial grooves formed in the hub portions of contiguous pairs of discs. In Fig. 3 the flow of steam is very similar to that in the form illustrated in Fig. 1 whilst in Fig. 5 the flow of steam is similar to that of the form illustrated in Fig. 2, the grooves 10 being progressively larger towards the low pressure end of the turbine, whilst the passage 11*a* through which steam passes outwards through the space 6 to a low pressure region is larger than the passage 11 through which the steam passes inwards from regions of relatively higher pressure.

Of course, no passages or holes will be provided in the last disc at the low pressure end of a section of the turbine or at the exhaust end thereof.

It will be understood that the application of the invention is not limited to turbines in which all the moving blades are mounted on discs but may be employed where discs are provided in a portion only of the turbine.

While I have shown my invention in four forms, it will be obvious to those skilled in the art that it is not so limited, but is susceptible of various other changes and modifications without departing from the spirit thereof, and I desire, therefore, that only such limitations shall be placed thereupon as are imposed by the prior art or as are specifically set forth in the appended claims.

What I claim is:—

1. A turbine of the reaction type having blade carrying discs, defining pockets therebetween, said discs being provided with means for causing a circulation of steam into and through said pockets.

2. A turbine as set forth in claim 1 having one or more perforations through some of the rotating blade carrying discs for causing a circulation of steam from the blading through the pockets between the various discs and outwards into the blading at a region of lower pressure.

3. A turbine rotor comprising a shaft with a series of blade-carrying discs mounted thereon, said rotor being provided with suitable passages between discs intermediate the ends thereof whereby steam circulates through the spaces between intermediate discs.

4. In a turbine, a rotor having blade carrying discs, defining pockets therebetween and provided with passages for producing a circulation of steam through the pockets between adjacent blade carrying discs.

In testimony whereof, I have hereunto subscribed my name this ninth day of December 1921.

KARL BAUMANN.